# New method to model hollow-bearing trees in coastal NSW forests

**This note summarises research to explore the effectiveness of forestry rules for tree hollows on state forests. This work was carried out by researchers at the Australian National University, led by Professor Philip Gibbons, as part of the Coastal IFOA Monitoring Program.**

Researchers tested a method to evaluate how many hollow-bearing trees are perpetuated in NSW forests under the Coastal Integrated Forestry Operations Approval (IFOA). The researchers worked with modellers at the Forestry Corporation of NSW (FCNSW), using their Forest Resource and Management Evaluation System (FRAMES) model.

## Simulation modelling gives better estimates for hollow bearing trees

Research shows that less than 50 percent of trees with hollows visible from the ground are typically occupied by vertebrate hollow-dependent fauna. As a result, methods that use tree diameter (diameter breast height, DBH) and tree species alone to predict how many hollow-bearing trees occur will over-estimate the number of hollow-bearing trees suitable for vertebrate species.

A new model was developed to predict the number of hollow-bearing trees suitable for occupancy by vertebrate fauna. This model was combined with FRAMES outputs to give a more accurate picture of habitat features within state forests and how they are changing over time. This improved understanding can better inform adaptive management and monitoring for hollow bearing trees.

## Testing the model on the NSW north coast

The number of hollow-bearing trees and number of trees with hollows suitable for occupancy by vertebrate fauna were able to be predicted using a combination of FRAMES outputs and hollow occupancy models.

A desktop based pilot study was undertaken for the Coffs Harbour Timber Zone (58,041 ha) on the north coast of New South Wales. FRAMES simulated changes in stems per hectare (by DBH class and tree species group) across a pilot study area over 200 years. These data were, in turn, used to predict how many hollow-bearing trees occur over 200 years.

Modelled simulations over a 200 year period showed the Coastal IFOA conditions in the net-harvest area maintain a stable:

- 8-10 trees per hectare with visible hollows and
- 2-3 trees per hectare with hollows suitable for occupancy by vertebrate fauna.

In areas permanently excluded from harvesting (approximately 51 percent of the study area):

- trees with visible hollows were predicted to increase from a mean of 8 per hectare to 26 per hectare and
- trees with hollows suitable for occupancy by vertebrate fauna were predicted to increase from a mean of 3 per hectare to 10 per hectare.

The modelling is limited by the small number of field observations, the wide confidence limits for predicting hollow bearing trees suitable for dependent fauna and the small set of variables recorded in FRAMES simulation outputs. With further testing and minor changes, the model can be expanded and the FRAMES outputs used to simulate proposed changes to the approval on the tree hollow resource.

# Refining and expanding the use of hollow modelling across the state

The researchers have identified a number of steps and improvements that would test the methods piloted in Coffs Harbour and allow them to be used more broadly to simulate hollow-bearing trees in NSW forests.

These include:

- source all available data on hollow-bearing trees occupied by vertebrate fauna to develop an improved model to predict which trees are suitable for occupancy by vertebrate fauna –then incorporate this improved model into FRAMES.
- use the improved model to identify a common set of variables that are:
  - recorded when selecting hollow-bearing trees for retention and in inventory plots
  - used in FRAMES to predict which trees contain hollows suitable for occupancy by vertebrate fauna.
- further improvements for fires — and the associated mortality and collapse of trees and any change in the rate of hollow formation in existing trees — as a random variable into FRAMES.
- compare predictions from FRAMES with data collected through a field-based pilot study.

# More information

This research was undertaken to develop a method to predict how many hollow-bearing trees are provided over the long-term in forests of New South Wales managed under the Coastal IFOA. This work is part of the **key habitat features strategy** within the Coastal IFOA monitoring plan.

This strategy is designed to:

- monitor if the key habitat features are being provided in an appropriate number and configuration to ensure persistence of key habitat dependent fauna, and
- determine if habitat resources are being perpetuated within harvested areas at the number required to maintain fauna species.

The reports detailing the proposed methodology using FRAMES and the feasibility evaluation, can be found on the **Commission's website**. This work was conducted prior to the introduction of the Site-specific biodiversity condition for Greater Gliders in the Coastal IFOA region and future modelling will incorporate the new requirements.